

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

1. (Currently Amended): In an optical fiber communications system, a method for maintaining jitter tolerance of data transmitted across the communications system, the method comprising:
  - receiving a tributary complying with a jitter tolerance;
  - recovering data from the tributary;
  - receiving a reference clock;
  - generating at least two low-speed data channels, wherein the low-speed data channels in aggregate contain the recovered data and each low-speed data channel is timed by a clock based on the reference clock;
  - modulating each low-speed data channel to generate a corresponding low-speed symbol channel, wherein the step of modulating comprises encoding a low-speed channel according to a Reed-Solomon code and interleaving the encoded low-speed channel; and
  - frequency division multiplexing the low-speed symbol channels to produce an electrical high-speed channel for transmission in optical form across the communications system.
2. (Original): The method of claim 1 wherein the tributary and the jitter tolerance conform to a SONET protocol.
3. (Original): The method of claim 2 wherein each low-speed data channel includes:
  - a framing header and a data rate which conforms to the SONET protocol; and
  - a payload which does not conform to the SONET protocol.

4. (Original): The method of claim 3 wherein each low-speed data channel includes:
  - a framing header and a data rate which conforms to the STS-3 protocol; and
  - a payload which does not conform to the STS-3 protocol.
5. (Original): The method of claim 3 wherein each low-speed data channel includes:
  - a framing header and a data rate which conforms to the STS-48 protocol; and
  - a payload which does not conform to the STS-48 protocol.
6. (Original): The method of claim 1 wherein the step of generating the low-speed data channels comprises:
  - recovering a clock from the tributary;
  - phase aligning the reference clock to the recovered clock;
  - retiming the recovered data using the phase-aligned reference clock; and
  - time division demultiplexing the retimed, recovered data into the low-speed data channels.
7. (Original): The method of claim 6 wherein the step of time division demultiplexing the recovered data into the low-speed data channels occurs in at least two stages.
8. (Original): The method of claim 1 further comprising:
  - converting the electrical high-speed channel to an optical high-speed channel;
  - transmitting the optical high-speed channel across a fiber;
  - receiving the optical high-speed channel;
  - converting the received optical high-speed channel to a receive-side electrical high-speed channel;
  - frequency division demultiplexing the receive-side electrical high-speed channel into at least two receive-side low-speed symbol channels;
  - demodulating each receive-side low-speed symbol channel to generate a corresponding receive-side low-speed data channel;

recovering a clock and data from each receive-side low-speed data channel;  
 generating a receive-side reference clock synchronized to the receive-side recovered data;  
 and  
 generating a receive-side tributary, wherein the receive-side tributary contains all of the  
 receive-side recovered data, and the receive-side tributary is timed by a clock  
 based on the receive-side reference clock and complies with the jitter tolerance.

9. (Original): The method of claim 8 wherein the tributary, the receive-side tributary and the  
 jitter tolerance conform to a SONET protocol.

10. (Original): The method of claim 8 wherein the step of generating the receive-side tributary  
 comprises:

time division multiplexing the receive-side recovered data into the tributary.

11. (Original): The method of claim 10 wherein the step of time division multiplexing the  
 receive-side recovered data into the tributary comprises:

storing the recovered data from each receive-side low-speed data channel;  
 aligning a timing for the receive-side low-speed data channels; and  
 time division multiplexing the stored recovered data according to the aligned timing.

12. (Currently Amended): In an optical fiber communications system, a method for maintaining  
 jitter tolerance of data transmitted across the communications system, the method comprising:

receiving an optical ~~electrical~~ high-speed channel containing data transmitted across the  
 communications system, the data from a tributary complying with a jitter  
 tolerance before said transmission;  
 frequency division demultiplexing an ~~the~~ electrical high-speed channel into at least two  
 low-speed symbol channels, wherein the electrical high-speed channel is derived  
from the optical high-speed channel;

demodulating each low-speed symbol channel to generate a corresponding low-speed data channel, wherein the step of demodulating comprises reversing a Reed-Solomon encoding on a low-speed channel and de-interleaving the low-speed channel;  
 recovering data from each low-speed data channel;  
 generating a reference clock synchronized to the recovered data; and  
 generating a tributary, wherein the tributary contains all of the recovered data, and the tributary is timed by a clock based on the reference clock and complies with the jitter tolerance.

13. (Original): The method of claim 12 wherein the tributary and the jitter tolerance conform to a SONET protocol.

14. (Original): The method of claim 13 wherein each low-speed data channel includes:  
 a framing header and a data rate which conforms to the SONET protocol; and  
 a payload which does not conform to the SONET protocol.

15. (Original): The method of claim 14 wherein each low-speed data channel includes:  
 a framing header and a data rate which conforms to the STS-3 protocol; and  
 a payload which does not conform to the STS-3 protocol.

16. (Original): The method of claim 14 wherein each low-speed data channel includes:  
 a framing header and a data rate which conforms to the STS-48 protocol; and  
 a payload which does not conform to the STS-48 protocol.

17. (Original): The method of claim 12 wherein the step of generating the tributary comprises:  
 time division multiplexing the recovered data into the tributary.

18. (Original): The method of claim 17 wherein the step of time division multiplexing the recovered data into the tributary occurs in at least two stages.

19. (Original): The method of claim 17 wherein the step of time division multiplexing the recovered data into the tributary comprises:

- storing the recovered data from each low-speed data channel;
- aligning a timing for the low-speed data channels; and
- time division multiplexing the stored recovered data according to the aligned timing.

20. (Original): The method of claim 19 wherein the step of aligning a timing for the low-speed data channels comprises:

- generating a framing pulse for each low-speed data channel; and
- aligning the framing pulses.

21. (Currently Amended): An optical fiber communications system for maintaining jitter tolerance of data transmitted across the communications system, the communications system comprising:

- a local oscillator for generating a reference clock conforming to a jitter tolerance;
- a clock and data recovery circuitry coupled to the local oscillator for recovering data from a received tributary and for retiming the recovered data according to the reference clock;
- a time division demultiplexer coupled to the clock and data recovery circuitry for time division demultiplexing the recovered data into at least two low-speed data channels, wherein each low-speed data channel is timed by a clock based on the reference clock;
- a modulator coupled to the time division demultiplexer for modulating each low-speed data channel to generate a corresponding low-speed symbol channel wherein the modulator comprises a Reed-Solomon encoder for encoding a low-speed data channel according to a Reed-Solomon code and an interleaver for interleaving a digital string output by the Reed-Solomon encoder; and

a frequency division multiplexer coupled to the modulator for frequency division multiplexing the low-speed symbol channels to produce an electrical high-speed channel for transmission in optical form across the communications system.

22. (Original): The communications system of claim 21 wherein the tributary and the jitter tolerance conform to a SONET protocol.

23. (Original): The communications system of claim 22 wherein each low-speed data channel includes:

a framing header and a data rate which conforms to the SONET protocol; and  
a payload which does not conform to the SONET protocol.

24. (Original): The communications system of claim 23 wherein each low-speed data channel includes:

a framing header and a data rate which conforms to the STS-3 protocol; and  
a payload which does not conform to the STS-3 protocol.

25. (Original): The communications system of claim 23 wherein each low-speed data channel includes:

a framing header and a data rate which conforms to the STS-48 protocol; and  
a payload which does not conform to the STS-48 protocol.

26. (Original): The communications system of claim 21 wherein the time division demultiplexer includes a multi-stage time division demultiplexer.

27. (Original): The communications system of claim 21 further comprising:

an E/O converter coupled to the frequency division multiplexer for converting the electrical high-speed channel to an optical high-speed channel and for transmitting the optical high-speed channel across a fiber;

an O/E converter for receiving the optical high-speed channel and for converting the received optical high-speed channel to a receive-side electrical high-speed channel;

a frequency division demultiplexer coupled to the O/E converter for frequency division demultiplexing the receive-side electrical high-speed channel into at least two receive-side low-speed symbol channels;

a demodulator coupled to the frequency division demultiplexer for demodulating each receive-side low-speed symbol channel to generate a corresponding receive-side low-speed data channel;

a receive-side data recovery circuitry coupled to the demodulator for recovering data from each receive-side low-speed data channel;

a phase-locked loop coupled to the receive-side data recovery circuitry for generating a receive-side reference clock synchronized to the receive-side recovered data; and

a time division multiplexer coupled to the receive-side data recovery circuitry and the phase-locked loop for generating a receive-side tributary, wherein the receive-side tributary contains all of the receive-side recovered data, and the receive-side tributary is timed by a clock based on the receive-side reference clock and complies with the jitter tolerance.

28. (Original): The communications system of claim 27 wherein the tributary, the receive-side tributary and the jitter tolerance conform to a SONET protocol.

29. (Original): The communications system of claim 27 wherein the time-division multiplexer comprises:

a state machine for aligning a timing for the receive-side low-speed data channels;

buffers for storing the recovered data from each receive-side low-speed data channel and releasing the stored recovered data according to the aligned timing; and

multiplexers for combining the released data.

30. (Currently Amended): An optical fiber communications system for maintaining jitter tolerance of data transmitted across the communications system, the communications system comprising:

- a receiver for receiving an optical ~~electrical~~ high-speed channel containing data transmitted across the communications system, the data from a tributary complying with a jitter tolerance before said transmission;
- a frequency division demultiplexer coupled to the receiver for frequency division demultiplexing an ~~the~~ electrical high-speed channel into at least two low-speed symbol channels, wherein the electrical high-speed channel is derived from the optical high-speed channel;
- a demodulator coupled to the frequency division demultiplexer for demodulating each low-speed symbol channel to generate a corresponding low-speed data channel, wherein the demodulator comprises a Reed-Solomon decoder for reversing a Reed-Solomon encoding and a de-interleaver for reversing an interleaving process;
- a clock and data recovery circuitry coupled to the demodulator for recovering data from each low-speed data channel and for generating a reference clock synchronized to the recovered data; and
- a time division multiplexer coupled to the clock and data recovery circuitry for generating a tributary, wherein the tributary contains all of the recovered data, and the tributary is timed by a clock based on the reference clock and complies with the jitter tolerance.

31. (Original): The communications system of claim 30 wherein the tributary and the jitter tolerance conform to a SONET protocol.

32. (Original): The communications system of claim 31 wherein each low-speed data channel includes:



a framing header and a data rate which conforms to the SONET protocol; and  
a payload which does not conform to the SONET protocol.

33. (Original): The communications system of claim 32 wherein each low-speed data channel includes:

a framing header and a data rate which conforms to the STS-3 protocol; and  
a payload which does not conform to the STS-3 protocol.

34. (Original): The communications system of claim 32 wherein each low-speed data channel includes:

a framing header and a data rate which conforms to the STS-48 protocol; and  
a payload which does not conform to the STS-48 protocol.

35. (Original): The communications system of claim 30 wherein the time division multiplexer comprises a multi-stage time division multiplexer.

36. (Original): The communications system of claim 30 wherein the time division multiplexer comprises:

a state machine for aligning a timing for the receive-side low-speed data channels;  
buffers for storing the recovered data from each receive-side low-speed data channel and  
releasing the stored recovered data according to the aligned timing; and  
multiplexers for combining the released data.